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Opening GES DISC Data to GIS Users

a progress report by Lee Kyle, William Teng, George Serafino, Nathan Pollack, Jianhe (John) Qu, and Long Chiu

The Goddard Earth Sciences (GES) Data and Information Services Center (DISC) is working on a program to make its extensive Earth sciences data collection easily available to Geographic Information System (GIS) users. GIS is a generic name for software systems that display various types of information, such as overlays on geographic maps, and permit analysis of the results. GIS has its own long history and has developed its own large customer base in fields such as urban planning, health, natural resource management, environment, etc. It also has its own GIS analysis software packages, procedures, and formats, such as shapefiles and Archinfo interchange files. While the GES DISC has data that would be helpful in these various fields, GIS users have not widely exploited our data holdings because of problems.

Three main problems presently restrain GIS users from making wider use of the Earth science data at the GES DISC and similar Earth science archives. 1: At the NASA ar-

chives the primary Earth science data format is HDF-EOS (Hierarchical Data Format-Earth Observing System), specifically tailored for EOS data sets. Standard GIS packages do not handle this format. 2: The volume of data and the number of files presently flowing into the archive are large (terabytes monthly). 3: Many files are too large to be handled by the average local GIS user. For instance, the Moderate Resolution Imaging Spectrometer (MODIS) data sizes can reach several hundred megabytes per file. These problems make it difficult for the average GIS user to search for and then employ useful data products from the NASA archives.

The GES DISC, through its Distributed Active Archive Center (DAAC) and Products Services Cooperative (PSC) components, has been involved in several GIS related initiatives designed to address these issues. One approach uses a network of Remote Sensing Information Partnerships (RSIPs). The

RSIPs are secondary data distribution sites, usually universities, that “own” data for redistribution to local users and for their own use. The GES DISC is presently working with the RSIPs to make it easier for them to acquire any desired portion of the extensive Earth science data in its archive. The standard products are preprocessed into a form more usable to the RSIP, including geographic subsetting, reformatting, and reprojection of the data. These partners specify the data products and formats desired, use them to produce additional, value-added data products and then may distribute the products to their own local networks of customers. These customers may include state and local agencies, applications users, and interdisciplinary and discipline researchers.

The second approach uses the World Wide Web to directly interact with individual GIS users. On-line capabilities allow interactive data searching, visualization, and overlaying of layers as done in tradi-

continued on page 2

tional GIS packages. The user can retrieve both the data (in either binary or shapefile format) and the analysis results as desired. This GIS interoperability effort is presently in a pilot stage and is planned to be in accord with the work of the Open GIS Consortium. Both efforts are part of an ongoing program at the GES DISC to make the archived Earth science data more accessible and useful to present and future customers. Further details of these efforts will be presented later in this article.

HDF vs GIS Format and File Size Issues

The GES DISC doesn't have the resources to convert and store its massive and growing data collection in two formats when potential GIS users would only be interested in a fraction of the available data. Before a GIS customer base is set up, it is very difficult to determine which data should receive priority conversion to GIS format. To obtain assistance in this matter, the GES DISC is partnering with its RSIPs and with specialty groups in fields such as resource management, public health, etc. The partners will designate remotely sensed data products of use in their work that the GES DISC will transform to a GIS format and forward to them. Each partner, in turn, has its own customer and partners base that it furnishes with its finished products. The GES DISC presently has such a program with the Uni-

versity of New Mexico (UNM) and is developing another with the Rutgers University Center of Remote Sensing & Spatial Analysis (CRSSA) in New Jersey. Additional partnerships in the GIS field are planned.

The GES DISC furnishes the UNM Earth Data Analysis Center (EDAC) RISP with Tropical Rainfall Measuring Mission (TRMM) regional subsets of rain data. The TRMM standard products are re-sampled to gridded regional subsets that are further transformed into GIS compatible files. These subset files are pulled by EDAC on a regular basis. They use GIS packages such as ERSI's ArcView, but are unfamiliar with HDF and Fortran or C; hence, the need for GIS compatible format files.

NOTE: The grayscale thumbnails that follow are included here to give you an idea of what they look like. To see the full color figures, look for them on the Global Scanner Web site at

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter/Pages/Article1.html

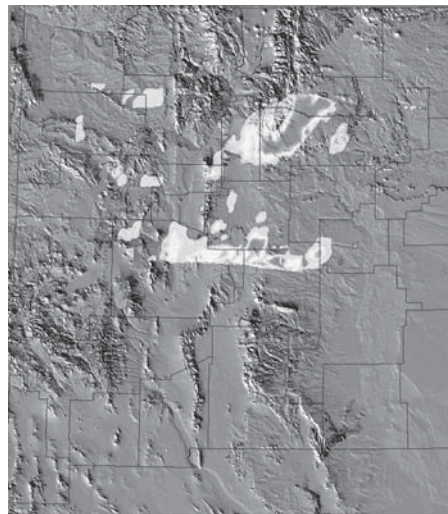


Figure 1

Figure 1 shows a satellite swath of TRMM rainfall over New Mexico over shaded relief and county lines. Heavy rainfall is indicated by red, while pale and medium blue indicate light rain.

Additional features such as cities, rivers, and land parcels can also be easily displayed. EDAC is the New Mexico State extension agency that provides data and information services to local users such as farmers and ranchers. EDAC is using the TRMM rain data to improve monitoring of the Rio Grande River watershed water budget, among other applications. In the future the GES DAAC plans to also furnish them with selected MODIS data products, e.g., vegetation index and surface reflectance data.

Rutgers-CRSSA is interested in obtaining various remote sensing data products with emphasis on selected MODIS land products for the region in and around New Jersey. CRSSA uses GIS software extensively and has requested the data in a GIS compatible format. MODIS land product imagery is produced in a new map projection called the Integerized Sinusoidal (ISIN) projection, which is not supported by most existing GIS software. Further, the ISIN projection produces noticeable distortion in several continents including North America, Australia, and Asia. To improve this situation the GES DISC has obtained a beta version of the MODIS Reprojection Tool (MRT) developed at the Earth Resources Observation Systems (EROS) Data Center (EDC). It can reproject MODIS ISIN 2D grid maps into

An expanded and updated version of *The Global Scanner* is available on our Web site at

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter

News of noteworthy events that occur in the interim between publication of this issue and the next will be posted there along with goodies we feel may be helpful to our users. Be sure to visit the site from time to time.

nine different projections: Geographic, Hammer, Interrupted Goode Homolosine, Integerized Sinusoidal, Lambert Azimuthal, Lambert Conformal Conic, Mollwide, Polar Stereographic, and Universal Transverse Mercator. The MRT also includes spectral and spatial subsetting, resampling, and GIS conversion functions.

The GES DISC obtains the desired MODIS surface reflectance and vegetation indices from the EDC archive, produces the desired subsets, transforms them to a GIS compatible format and makes them available to CRSSA. This is a case where the GES DISC acts as a “broker” for obtaining the requested data, since the MODIS land products are archived exclusively at the EDC DAAC (the DAAC at GSFC is responsible for archiving MODIS ocean, atmosphere, and calibrated radiance data products). CRSSA is presently evaluating the available products and setting up their program.

As an illustration of the steps involved in the process, these MODIS images show a sample of the 8-day (started 9/30/2000) composite of 1 km surface reflectance bands 1 (red), 4 (green) and 3 (blue) for a portion of the eastern U.S. that includes New Jersey. The original ISIN projection is shown in Figure 2. Figure 3 is the same scene re-projected to the less distorted Geographic projection. The last image, Figure 4, is an example of a final GIS type product created by the Rutgers group using MODIS surface reflectance data obtained from the EROS Data Center (EDC) and preprocessed by the GES DAAC to

a more suitable projection (Lambert Azimuthal).

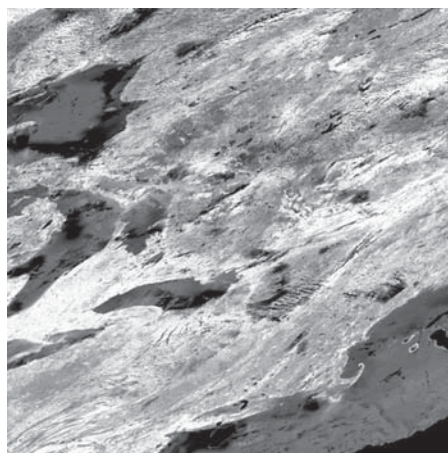


Figure 2

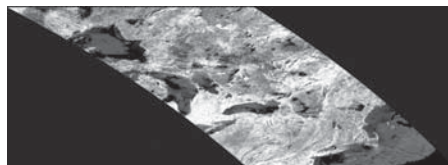


Figure 3



Figure 4

A Web Solution

Last year, in a separate effort to reach the general GIS user or potential user, the GES DISC set up a GIS Web page open to the general public.

<http://daac.gsfc.nasa.gov/WEBGIS/>

This is an evolving, experimental site that presently displays regional TRMM rainfall observations over the southern part of the United States. In this current version, the user selects criteria (region or state in the southern half of the USA, and date of satellite image) and is then offered a choice of ancillary GIS data layers (political boundaries, cities, roads, rivers, etc.). The software searches the site's data holdings and reads and uses the retrieved data and associated GIS data layers to create a map. This is then displayed in the user's Web browser, with the viewer being able to download the map and associated satellite data either in the original GES DISC formats (HDF-EOS, or binary) or GIS formats (shapefiles, OpenGIS standards). Figure 5 is an example of a typical map that can be displayed at this site today.

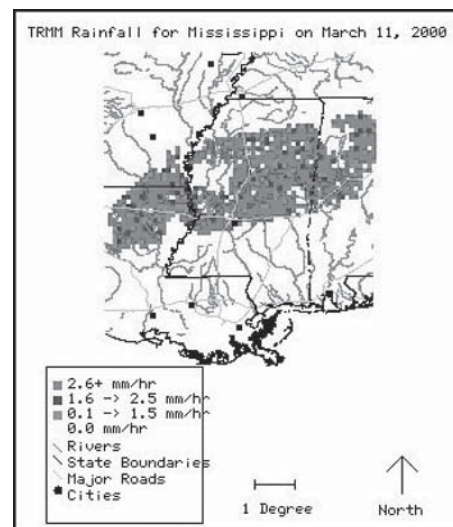


Figure 5. Here the TRMM observed rainfall is shown for the Mississippi region on March 11, 2000. The state boundaries, rivers, major cities, and roads are included on the overlay map.

continued on page 4

At this point there are limited TRMM data available in the GIS format, but the site's capabilities are being expanded to include selected MODIS data sets in the near future.

The GES DISC is designing and constructing its own custom WebGIS software because commercial GIS programs do not meet all of our present and future requirements, which include handling HDF-EOS and binary formats, and interacting with existing GES DISC programs. The plan envisions users eventually being able to search and display for review large segments of the data holdings at the GES DISC. Only after the GIS customer makes a data selection would the required data be converted to a GIS compatible format, such as GeoTIFF. To obtain feedback, the concept has been presented at several professional meetings (see References and the General News sections in this issue and also in the Spring 2000 and Fall 2000 issues). The WebGIS design adheres to the protocols defined by the Open GIS Consortium (OGC). An important part of the OpenGIS infrastructure implanted at the GES DAAC involves the use of a Digital Oceanographic Data Server (DODS) as the underlying engine, upon which a "translator" layer resides to render the DODS output OGC-compliant for transmission to OpenGIS clients. The advantages of DODS includes the ability to read in various formats (HDF, netCDF, binary, etc.), provide spatial and parameter subsetting capabilities for gridded data, and output all results in an interme-

diate format suitable for interoperability purposes. DODS has been introduced at the GES DISC as part of a separate initiative (see "Partners" on page 4 of the Spring 2000 issue). Adhering to Open GIS standards will allow GES DISC data to be available to a potentially larger and more diverse audience. The completed system promises to become a most useful tool for online visualization and analysis of many of the GES DAAC data holdings suitable for applications purposes. As an example, a DODS-enabled Open GIS server has been installed at the GES DAAC and is being evaluated for use as a tool in connection with environment and health studies involving remotely sensed, *in situ*, and clinical data sources.

The several RSIP partner programs and the Open GIS Web program discussed above reinforce and supplement each other in opening the GES DISC data to GIS users in many important applications areas. User feedback is encouraged and needed to optimize the system. Comments and questions concerning the WebGIS initiative should be directed to Nathan Pollack,

pollack@daac.gsfc.nasa.gov
or Bill Teng,
teng@eosdata.gsfc.nasa.gov

References

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Pollack, N., W. Teng, and G. Serafino, 2001. "Accessing GIS-compatible GDAAC data via WebGIS," AAG, February 27–March 2, 2001, New York.

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The GES DISC Archive Web Page. Both TRMM and MODIS data are obtainable here in HDF format.

<http://daac.gsfc.nasa.gov/>

Earlier issues of the *Global Scanner*, newsletter of the GES DISC are available on line at

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter/

Scroll down to Previous Issues and click the desired issue.

Detailed information on the MODIS Reprojection Tool can be found at

<http://ede.usgs.gov/programs/sddm/modisdist/index.shtml>

To obtain selected GSFC DAAC data sets via DODS go to

http://daac.gsfc.nasa.gov/DAAC_DOCS/DODS.html

Developing a Simplified MODIS Processing System

by Christopher Lynnes



Science data processing systems range from simple sets of scripts to large, complex systems with powerful planning and scheduling capabilities. The EOSDIS Core System (ECS), used by the Goddard Earth Science (GES) Distributed Active Archive Center (DAAC) to process data from the Moderate Resolution Imaging Spectroradiometer (MODIS), falls into the latter category. It includes several hundred thousand lines of custom code, together with a commercial planner-scheduler and relational data base. That code line count is just for the master control system and does not include the science algorithms that produce the desired science products. The system has effectively processed data from the Terra satellite, which corresponds to about 1260 jobs per day. Over the next 3 years, however, that number will increase by a factor of six as the Aqua satellite is launched and reprocessing is undertaken for each satellite at double the data rate, which will result in about 7500 jobs per day. To expand ECS's performance overhead to handle the increased load would require complicated and expensive upgrading. Instead, the GES DAAC has decided to process the data with a system from the other end of the complexity spectrum.

The Simple, Scalable, Script Based Science Processor (S4P)

S4P is a set of Perl scripts that implements a data driven system: when data arrive, processing is triggered. S4P implements a factory assembly line paradigm: it consists of "stations" implemented as UNIX directories with a configuration file and monitored by a daemon called "stationmaster." A processing job in

a given station is triggered when the stationmaster detects arrival of a "work order," actually an ASCII file with information about input files. Output work orders are shipped to downstream stations when processing is complete. A simple graphical user interface (also written in Perl) can be used to monitor stations and jobs and to troubleshoot and control jobs (Figure 1). S4P is already in use within the GES DAAC for supporting data mining (see *Global Scanner* Fall 2000 issue, p. 1), quick response MODIS processing, and MODIS direct broadcast processing (see *Global Scanner* Spring 2000 issue, p. 6).

In the present stage of computer systems development, simplicity is a virtue in designing processing systems. Complex processing systems are expensive both to construct and to maintain. The rationale behind the S4P system emphasizes the 80-

Station	Jobs	Success	Failed
Request Data		0	0
Receive DH		0	0
Catch Data		0	0
Specify Data		3	0
Granule Find	 	1	0
Trigger PGE		1	0
Allocate Disk	 	0	1
Run PGE:RUN_MoPGE01	 	1	0
Run PGE:RUN_MoPGE02		1	0
Run PGE:RUN_MoPGE03		1	0
Local Data		1	0
Export	 	0	0
Granule Central		2	0
Receive PAN		0	0
Clean Data		0	0
Repeat Hourly	 	0	0

Refresh Exit

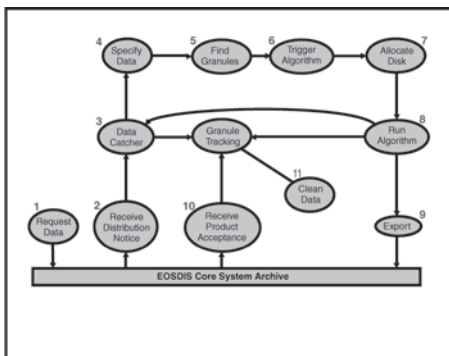
Figure 1. The stations are the buttons in the left column. Jobs within a station are the boxes. A green box is a running job, blue is a pending job, and red represents a failed job. A red station indicates that the station is not currently running. The science products are produced by science team supplied algorithms called Product Generation Executables (PGEs). Thus MoPGE01 is the first MODIST science algorithm.

continued on page 6

20 rule: 20% of code gives 80% of desired system. Proper design often allows sharply reducing or even ignoring the remaining 20% of the so-called “ideal” system. S4P uses the operating system as much as possible and is designed to make finding and fixing processing problems quick and easy. The design also minimizes the effort needed to insert and run the science team supplied algorithms that produce the desired science products. S4P is similar in concept to the EROS Data Center AVHRR 1KM processing system, but with modifications to allow varied science algorithms and improve portability.

An S4P implementation actually consists of two main parts: the S4P infrastructure (stationmaster, station monitor, and support libraries and scripts), which is common to various S4P systems; and the station configuration and scripts specific to a particular S4P system. The system to replace ECS’s data processing is known as S4P-MODIS, or S4PM (Figure 2) and it consists of only 10,000 lines of code.

For S4PM, the typical scenario is as follows:



1. If reprocessing data, the production planner uses a simple graphical user interface to select

raw (Level 0) MODIS data for processing. A request is submitted to ECS for the data. If processing current data instead of reprocessing, this step is unnecessary. The data are instead shipped automatically by subscription.

2. ECS stages the data to S4PM and sends a distribution notice when the data are ready.
3. The Data Catcher station checks the metadata for the input files and renames them according to a common convention used within S4PM. The files are also registered with the Granule Tracking station. Each one is assigned a number of “uses,” corresponding to the number of times it is to be used for any purpose, such as processing or saving to the archive.
4. The Specify Data station puts together a list of all of the additional data needed to process the input files.
5. The Find Granules station locates the files corresponding to those additional data.
6. Trigger Algorithm creates a process control file that is used by the science algorithms to provide all information about input files, output files, and runtime parameters. However, it leaves the directory names of the output files blank, to be filled in by the Allocate Disk station, which allocates space for the output files and fills in the directory name.
7. The Run Algorithm station actually runs the science processing algorithm. If successful, it sends a list of all the output files to the Data Catcher station, which starts the process over again for the next science algorithm in the

chain. It also sends a list of the input files to the Granule Tracking station so that the number of uses can be decreased appropriately. Finally, it sends a list of the output files to

9. the Export station, which tells ECS to pick them up and save them.
10. When ECS has saved them, it sends back a product acceptance notice. The Receive Product Acceptance station sends a list of the saved files to Granule Tracking.
11. If Granule Tracking indicates that a granule is all “used up,” i.e., the number of remaining uses is 0, it sends a notification to the Clean Data station, which removes the files from disk and frees up any allocated disk space.

One useful aspect of S4PM is that it can run on the same hardware as other processing systems so long as each system has a dedicated allocation of resources, such as disk and CPU. S4PM is currently undergoing testing on ECS hardware. Its first operational task will be to take on MODIS Terra reprocessing, beginning in late May. When S4PM has proven itself here, the near-real-time processing of Terra will transition over, and by the time Aqua launches, it will be handling all of the GES DAAC’s processing of MODIS data.

Reference

Earlier issues of the *Global Scanner*, newsletter of the GES DISC are available on line at

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter/

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GCMD Offers Search for Earth Science Data Related Services

by Dave Kendig, Miriam
Goldfarb, and Heather Weir



For almost a decade, the Global Change Master Directory (GCMD) has focused exclusively on its mission to assist the user community in the discovery of and linkage to Earth science data. It now contains some 9500 data set descriptions and serves as the International Directory Network (IDN). Recently, the mission was expanded to include the discovery of services related to Earth science data. Initially, the scope of the services included data handling tools, models, analysis and visualization packages, and educational materials. Each of these categories held several specific, descriptive subcategories, thus providing a hierarchical schema for the service search.

With the beta release of Earth science services, GCMD actively solicited user comments. Users responded by providing suggestions for new topics (keywords) to better describe their services and recommendations for improvements to the Web page layout and functionality. Additional keywords were requested to properly classify advisory services, processing algorithms, and geospatial tools. Minor changes were made to the Web design in response to comments.

Currently, a free-text interface to search for Earth science services and an online authoring tool are available. The free-text interface has a layout similar to the GCMD's free-text interface for data sets. However, work is progressing behind the scenes to provide a more robust model to extend functionality and improve long-term maintainability through the use of an object oriented data base model and the integration of the Extensible Markup Language (XML). XML is a powerful tool for data representation, storage, modeling, and interoperability. Also, a services keyword interface will be an added interface option, along with the free-text search, enabling users to quickly and accurately discover the services best suited for their needs.

Each service is thoroughly described using a format of predefined attributes called the SERF (Service Entry Resource Format). This format is unique in that it contains an attribute (Related_URL) that facilitates the process of linking service descriptions to Earth science data. For example, the Tropical Rainfall Measuring Mission (TRMM) sub-setting service description contains

a Related_URL link to the TRMM data page, thus expediting a user's search. This service description can be easily viewed by entering either 02-trmm-99 or TRMM in the service free-text search at

http://gcmd.nasa.gov/cgi-bin/md/services_search.pl

The service authoring tool, Service Documenter, enables users to create new service descriptions on line. A special feature is the ability to create a personalized template. This template allows authors to save the fields that may be used in future descriptions, thus reducing repetitious input such as author name or use constraints.

New users are encouraged to discover Earth Science service descriptions by visiting the GCMD home page and selecting the Earth Science Services link under the "What's new" section

<http://gcmd.nasa.gov>

or access the Earth Science Services page directly by entering

http://gcmd.nasa.gov/cgi-bin/md/services_search.pl

To add new service descriptions use the online documentation tool, Service Documenter, available from the above URL or

<http://gcmd.nasa.gov/serfbuilder/>

See also "Focused Views of NASA's Global Change Master Directory," by Lola Olsen and Gene Major, in *The Global Scanner*, Vol. 2, No. 2, Fall 2000 issue. Available at

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter/

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New Data Products General News People in the News



as reported by

George Serafino, James Acker, James Johnson, Hualan Rui, and others in the Data Support Group

NEW DATA PRODUCTS AND SERVICES

Detailed information about the archived data holdings at the GES DISC can be found at

<http://daac.gsfc.nasa.gov>

In this section we just emphasize important new happenings concerning our data holdings. These are arranged by data categories.

ATMOSPHERIC CHEMISTRY

Ozone and other trace gas compositions, dynamics, and energy interactions of the upper atmosphere.

GOME Data From ERS-2

Global Ozone Monitoring Experiment (GOME) data from the ERS-2 spacecraft consist of daily, interpolated, global coverage of total ozone integrated over the depth of the atmosphere. These data are mirrored at the Goddard DAAC courtesy of the German Remote Sensing Data Center (DFD/DLR). The DAAC currently has all data up through year 2000 available on anonymous FTP at

http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/FTP_SITE/readmes/gome_daily.html

The site will be updated with year 2001 data as they are made available to us by the DLR.

MLS Version 5 Data From UARS

The latest reprocessed version of the Microwave Limb Sounder (MLS Version 5) flown aboard the Upper Atmosphere Research Satellite (UARS) spacecraft has recently been released by the DAAC at

http://daac.gsfc.nasa.gov/data/dataset/UARS/01_Instruments/MLS/index.html

This version represents the final reprocessing of the MLS data set, which extends from 9/91 through 7/99. Although Sulphur Dioxide (SO₂) has not been included in this processing, two new quantities, Methyl Cyanide CH₃CN and Geopotential Height, have been introduced and the temporal coverage of H₂O profiles has been extended from 4/93 in the previous version to 7/99 in the new version.

ATMOSPHERIC DYNAMICS

3-D dynamic and thermodynamic state of the Earth-atmosphere system, from satellite measurements and assimilation systems.

New Web Pages

The newly developed Education Page for Atmospheric Dynamics data sets has been released. For more information refer to

http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/atmospheric_dynamics/ad_education.html

The Atmospheric Dynamics Parameter View/Search Page has been revamped. The new release is available at

http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/atmospheric_dynamics/parameter_search/par_view.html

Field Experiments

Aircraft and ground based measurements of meteorological variables designed to improve science algorithms and validate satellite-derived data products.

Brochure Documents TRMM Campaigns

The Hydrology Data Support Team at the GES DAAC has published a brochure detailing the aircraft-based, ground-based, and ancillary data sets collected in support of the various TRMM field campaigns. These include the Texas Florida Underflight Experiments (TEFLUN A and B), TRMM-Large Scale Biosphere-Atmosphere Experiment in Amazonia (TRMM-LBA), Kwajalein Experiment (KWJEX), and South China Sea Monsoon Experiment (SCSMEX). This color brochure, intended as a handout at conferences and workshops, targets not only potential users who are presently unaware of our field experiment data holdings but also current users who will find it a convenient reference source. For more information about the TRMM field experiments, visit the GES DAAC's campaign website at

http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/TRMM_FE/index.html

HYDROLOGY

Global precipitation, its variability, and associated latent heating, important for studying the global hydrological cycle, climate modeling, and applications.

GPCP Version 2 Released

A new version of the Global Precipitation Climatology Product (GPCP Version 2) is now available that supersedes GPCP Version 1c. It comprises two products:

1. the combined satellite-gauge precipitation estimate
2. the combined satellite-gauge precipitation error estimate.

To access these data please go to

ftp://daac.gsfc.nasa.gov/data/hydrology/precip/gpcp/gpcp_v2_combined/

GSSTF Data Released at the GES DAAC

Version 1 of Goddard Satellite-Based Surface Turbulent Fluxes (GSSTF) data produced by the surface turbulent fluxes research group at NASA GSFC (Code 912) is now available. Currently, the DAAC maintains archives of three products (in binary format) from this data set. The first two provide daily and monthly-mean, global ocean, 2° latitude by 2.5° longitude, gridded surface fluxes and other related parameters, from 7/87–12/94. The third product provides the related 12 monthly-mean and one annual-mean climatology. These data are available at

<ftp://lake.nascom.nasa.gov/data/TRMM/Ancillary/gsstf>

An Orbit Viewer for Windows

A Windows version of the TRMM Science Data Information System (TSDIS) Orbit Viewer is available from the GES DAAC. The viewer can display, at the full instrument resolution, TRMM satellite, ground validation, browse, and satellite-ground coincidence subset products, and other derived products. It's available from

ftp://lake.nascom.nasa.gov/software/trmm_software/Orbit_Viewer/Windows/

MODIS DATA SUPPORT

Radiance data and auxiliary information such as geolocation and cloud mask, atmospheric profiles, and higher level ocean color data.

Level 4 Oceans Data

Four new MODIS Level 4 Oceans products were released by the DAAC in February 2001. These include

1. binned 4.6 km weekly (8-day) ocean productivity indices in the Integerized Sinusoidal Equal Area projection
2. mapped 4.6 km semianalytical weekly ocean primary production in the Cylindrical Equidistant projection
3. mapped 36 km semianalytical weekly ocean primary production in the Cylindrical Equidistant projection
4. mapped 1° semianalytical weekly ocean primary production in the Cylindrical Equidistant projection.

Atmospheres Data

The MODIS 8-day joint aerosol/H₂O/cloud product containing 8-day, 1° x 1° grid average values of atmospheric parameters related to atmospheric aerosol particle properties, total ozone burden, atmospheric water vapor, cloud optical and physical properties, radiation, and atmospheric stability indices was released in December 2000. This product also provides standard deviations, quality assurance weighted means, and other statistically derived quantities for each parameter. The equivalent MODIS monthly joint aerosol product was released in February 2001.

For more information on all of the above products please visit the DAAC MODIS data information and access site at

http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/MODIS/index.shtml

Researchers may also find useful products in our other important data set collections.

INTERDISCIPLINARY

Global land, ocean, and atmospheric parameters mapped to uniform spatial and temporal scales for basic research and applications studies.

LAND BIOSPHERE

Long time-series vegetation and thermal infrared brightness temperature data sets for global change research.

OCEAN COLOR

Remote sensing ocean color data used to investigate ocean productivity, marine optical properties, and the interaction of winds and currents with ocean biology.

For more details about the GES DISC data holdings and to order data see our Home Page or contact us by eMail, phone, or fax.

<http://daac.gsfc.nasa.gov/>

For MODIS User Services

eMail: daac_usg@gsfcsrvr4.gsfcmo.ecs.nasa.gov

phone: 301-614-5473

fax: 301-614-5304

For other products' User Services

eMail: daacuso@daac.gsfc.nasa.gov

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GENERAL NEWS

DISC Happenings

GES DISC/DAAC EOS Mission Support Startup

This "new" activity formally began on March 16, 2001, but it is a continuation of ongoing GES DISC mission support to the Earth Observing System (EOS). It will support current (Terra) as well as

continued on page 10

future (Aqua, Aura, etc.) EOS missions across all elements providing EOS Mission, Science, and Engineering support at the GES DAAC. EOS mission support includes the design and development of DAAC Unique Extensions (DUE); coordinating interaction among mission support elements at the GES DAAC daily; providing science, data, and user oriented perspective for system development and enhancements; providing science input into production priorities; interacting with EOSDIS (EOS Data and Information System), EOSDIS Data Gateway (EDG), and EOS Science Teams; representing the GES DAAC position; and routinely meeting with EOSDIS Science Development Managers and representatives. Science Software Integration & Test (SSIT) support will be part of this activity, as it deals with a number of EOS missions and data sets. Combining the Mission Support activities across all DAAC elements will solidify and increase the efficiency of this support area at the GES DAAC.

Bruce Vollmer will lead the EOS Mission Support group with the assistance of **Greg Leptoukh** who will head the Science Systems and Applications, Inc. (SSAI) contract support group. Greg will also continue to serve as the Science Lead for all EOS Mission Support at the GES DAAC including Terra, Aqua, and Aura Missions. Bruce will continue to lead the SSIT group while Greg will continue to lead the MODIS Data Support Team, which will remain as part of the GES DAAC Science Support Activity area. For a reference on the organization of the

GES DAAC see “The GES DAAC, How It Works,” in the Summer 1999 issue (Vol. 1, No. 1, page 3) of the *Global Scanner*, which can be obtained from

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter/

Scroll down to Previous Issues and click on the desired issue.

DODS Is Now Operational

Long Pham completed integration of the Distributed Oceanographic Data System (DODS) into the Data and Information Services Center (DISC). This is significant at two levels.

It provides GES DISC data users another mechanism for acquiring Earth science data and additional data products that were not previously available.

It represents a success for the Earth Science Enterprise (ESE) Federation by exemplifying how advanced technologies developed by one partner can be integrated into the environment of another partner to further facilitate the advancement of Earth sciences.

Check out our DODS Web page at

http://daac.gsfc.nasa.gov/DAAC_DOCS/DODS.html

For background information, see “Partners” in the Spring 2000 issue of the *Global Scanner* (Vol. 1, No. 4, page 4) available from

http://daac.gsfc.nasa.gov/DAAC_DOCS/Newsletter/

Scroll down to Previous Issues and click on the desired issue.

Meetings & Publications

Suhung Shen staffed the GES DISC DAAC booth in conjunction with Monica Holland of the Global Change Master Directory at the

Oceanology Americas-2001 Conference in Miami Beach, April 2–5. This was a major conference with a large number of exhibitions and presentations on both ocean science and ocean technology. Suhung also presented the poster “Access Ocean Color Data from the GES DISC DAAC” at the meeting of the Oceanography Society that was held simultaneously with the Oceanology Americas conference.

The **Christopher Lynnes** and **Robert Mack** contribution, “KDD Services at the Goddard Earth Sciences Distributed Active Archive Center,” a book chapter, was accepted for inclusion into *Scientific Data Mining* to be published by Kluwer. (See a review of the chapter in the Fall 2000 issue of the *Global Scanner*.) Chris and Robert also presented their paper, “An Approach to Data Center Based KDD of Remote Sensing Data Sets,” in the Third Workshop on Mining Scientific Data Sets, held in conjunction with the First SIAM conference on Data Mining on April 6, 2001, in Chicago.

Steve Kempner recently participated in a number of meetings whose basic aim was to make Earth science data more effectively and efficiently available to the public. January 8–12 he participated in the sixth Earth Sciences Enterprise (ESE) Federation meeting in Tucson. He serves as Chair of the Products and Services Standing Committee, which is working with the Global Change Master Directory (GCMD) to set up a complete inventory, searchable by categorical keywords, of all products and services available from Federation members (GCMD had already made all products available). The committee is also working on a

model by which new missions seeking data management expertise can provide their requirements to the Federation and have access to the Federation's pool of products and services. (See "Partners" in the Spring 2000 *Global Scanner* and the GCMD article on providing Search for Earth Science Data Related Services in this issue.)

On February 1, Steve participated in the Science Working Group on Data (SWGd) that was held in conjunction with the Investigator Working Group (IWG) in Ft. Lauderdale. He gave a presentation describing the GES ECS data distribution metrics, issues, and solutions. This was in conjunction with this group's mission to understand problems and issues connected with getting Earth science data into the archives and then out again to the user public.

Steve also attended the Distributed Active Archive Center (DAAC) Managers Meeting in Huntsville, Alabama, February 27–March 1. Topics discussed at the meeting included

available cross-DAAC distribution enhancement tools, long-term archive of data, system security, and the EOSDIS Core System (ECS) follow-on contract.

In December 2000, in connection with new missions, **Bruce Vollmer, George Serafino**, and other GES DISC notables met with the Atmospheric Infrared Sounder (AIRS) data support team to discuss AIRS Science Software Integration and Test progress, Operations Agreement documentation, and DAAC data support of AIRS data, postlaunch. The latter topic's discussion was headed by George and gave AIRS personnel much insight into the services and user support that the DAAC is committed to on behalf of AIRS. AIRS will fly on the Aqua spacecraft scheduled to be launched no earlier than September 2001. DISC personnel also attended an AIRS Science Team Meeting in Pasadena, February 21–23, 2001, and delivered a presentation focus-

ing on current and future DAAC data support services for AIRS, AMSU, and HSB products (see "Aqua with AIRS is Coming" in the Summer 2000 issue of the *Global Scanner*).

Data Metrics

SeaWiFS and TRMM archive and distribution support is proceeding smoothly.

- 1300 GB SeaWiFS, 2500 GB TRMM distributed in November and December 2000
- 750 GB SeaWiFS, 1750 GB TRMM distributed in January 2001.

Approximately 25 TB of TRMM, SeaWiFS, CZCS, TOMS, TOVS, UARS, and AVHRR data have been archived thus far.

Over 190 TB of data have been archived in ECS thus far.

Data are being routinely ingested from MODAPS.

All current Level 0 data ingested are processed with minimal delay.

About 8.5 TB of data have been distributed.

continued on page 12

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PEOPLE IN THE NEWS

Engineering Staff Newcomers

Randy Barth (DAAC System Engineering & SW Development Section Lead) reports that we've had a number of new people join our engineering staff over the last few months.

Dr. Jianfu Pan is a software developer, formerly with GSC-SAIC working on the MODAPS system.

Dana D'Aria is a software developer from RITSS who did CM work with ECS.

John Tu will be providing procurement support with Jean Bedet, PC support with Matt Bell, and will be working with our Catalyst server and Focus domain activities.

Dr. Guang-Dih Lei is a Data Base Administrator (DBA).

Ed Seiler is a software developer from RITSS who worked with the GSFC visualization studio and COBE and SeaWiFS.

Congratulations to Gail Wade

Gail recently earned the Associate of Applied Science degree, with honors, from Prince George's Community College. Ms. Wade was also inducted into Phi Theta Kappa (the Honor Society for 2-year colleges) in May 2000 and is listed in the National Dean's Annual Publication for 1999–2000. Way to go, Gail!

From Our Sister Organization, the Global Change Master Directory (GCMD)

Congratulations and farewell to Miriam Goldfarb

On February 14, 2001, Miriam gave birth to a baby boy, named Liam, and has since decided to dedicate herself full time to her family. Many thanks to Miriam for her efforts in the initial phases of introducing useful Earth science data related tools and services to EOSDIS. Since August 1999 she has served as the services coordinator for GCMD.

Welcome Heather Weir

Heather recently joined the GCMD staff and will be assisting with the identification and operation of invocable analytical resources for the directory. Heather is completing her Master's degree in physics from George Mason University.

The Global Scanner is a publication of NASA's Goddard Space Flight Center Earth Sciences (GES) Data & Information Services Center (DISC).
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